

**WHAT WE CLAIM IS:**

1. A process comprising the steps:

5 (i) hydrolysis of lactose to produce glucose and galactose;  
(ii) partial isomerisation of the glucose to fructose; and  
(iii) partial oxidation of the glucose to gluconic acid;

10 to produce a composition comprising a mixture of galactose, glucose, fructose, gluconic acid, unconverted lactose and non-lactose di- and oligo-saccharides without the need for any purification steps.

15 2. A process as claimed in claim 1 for the production of a composition comprising a mixture of approximately 10-50% galactose, 0-48% glucose, 1-25% fructose, 1-48% gluconic acid and 0-25% unconverted lactose and non-lactose di- and oligo-saccharides as a % of the total carbohydrate present.

20 3. A process as claimed in claim 2, wherein the composition comprises 30-50% galactose, 10-40% glucose, 5-25% fructose, 1-15% gluconic acid and 1-10% unconverted lactose and non-lactose di- and oligo-saccharides.

25 4. A process as claimed in claim 3, wherein the composition comprises 45-50% galactose, 23-33% glucose, 15-23% fructose, 1-5% gluconic acid and less than 7% unconverted lactose and non-lactose di- and oligo-saccharides.

5. A process as claimed in any one of claims 1 to 4 carried out as a continuous, semi continuous, batch, sequence batch or single-pot process.

30 6. A process as claimed in claim 1, wherein the isomerisation step (ii) is carried out after the oxidation step (iii).

7. A process as claimed in claim 1, wherein the hydrolysis step (i) and oxidation step (iii) are carried out simultaneously.

8. A process as claimed in claim 1, wherein the product of step (i) is separated into three streams wherein the first stream is not treated further and the second and third streams are treated according to steps (ii) or (iii) respectively and the products of each stream combined to provide a final composition as defined in any one of claims 2 to 4.

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9. A process as claimed in claim 8, wherein the product of the partial isomerisation step (ii) is split and a portion subjected to partial oxidation (step (iii)) and the remainder combined with the product of the partial oxidation step to produce a composition as defined in any one of claims 2 to 4.

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10. A process as claimed in claim 8, wherein the product of the partial oxidation step (iii) is split and a portion subjected to partial isomerisation (step (ii)) and the remainder combined with the product of the partial isomerisation step to produce a composition as defined in any one of claims 2 to 4.

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11. A process as claimed in any one of claims 1 to 10, wherein the lactose source is selected from the group comprising milk; UF permeate derived from whole milk, skim milk, whey or milk serum; pure lactose; whey; deproteinated whey; demineralised whey; decalcified whey; UF permeate derived from deproteinised, demineralised or decalcified whey; or any combination thereof.

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12. A process as claimed in claim 1, wherein the hydrolysis step (i) is achieved chemically, or enzymatically using one or more hydrolytic enzymes, or in a bioreactor.

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13. A process as claimed in claim 12 wherein the hydrolysis step (i) is achieved chemically by the use of acids or strong cation exchange resins.

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14. A process as claimed in claim 13, wherein the acids comprise a weak solution (0.001 - 0.1% of total weight of lactose) of one or more acids selected from hydrochloric acid, sulphuric acid, phosphoric acid, nitric acid and citric acid.

15. A process as claimed in claim 12, wherein the hydrolytic enzyme is a beta-galactosidase, also known as lactase, and is free or immobilized and is sourced from

*Kluyveromyces lactis, Kluyveromyces fragilis, Kluyveromyces marxianus, Saccharomyces fragilis, Streptococcus thermophilus, Aspergillus oryzae, Aspergillus niger, Lactobacillus bulgaricus, Lactobacillus helviticus, Lactobacillus salivarius, Lactobacillus fermentum, Lactobacillus casei, Lactobacillus acidophilus, Streptococcus lactis, Bifidobacterium bifidum, Bifidobacterium longum, Bifidobacterium adolescentis, Bifidobacterium breve, Bacillus subtilis, Escherichia coli, Sulfolobus species, Pyrococcus fusiosus, green coffee beans, jack beans, bovine liver, and bovine testes and any other suitable source either alone or in combination.*

10 16. A process as claimed in claim 15 wherein the enzyme is sourced from *Sulfolobus solfataricus*.

17. A process as claimed in claim 1, wherein the isomerisation step (ii) is achieved enzymatically, using glucose isomerase.

15 18. A process as claimed in claim 17, wherein said glucose isomerase is free or immobilized and is sourced from *Actinoplanes missouriensis*, *Bacillus coagulans*, *Streptomyces murinus*, *Escherichia coli* or *Arthrobacter species*, or any other suitable source either alone or in combination.

20 19. A process as claimed in claim 1, wherein the oxidation step (iii) is achieved enzymatically using two enzymes, a glucose oxidase and a catalase.

25 20. A process as claimed in claim 19, wherein said enzymes are free or immobilized, and wherein the oxidase enzyme is sourced from *Penicillium notatum*, *Penicillium glaucanum*, *Penicillium amagasakiense* and *Aspergillus niger*, and the catalase enzyme is sourced from *Aspergillus niger*, one or more *Penicillium* species and *Micrococcus lysodeikticus*, or wherein said enzymes are obtained from any other suitable source either alone or in combination.

30 21. A composition produced by the process of any one of claims 1 to 20, wherein said composition comprises a mixture of galactose, glucose, fructose, gluconic acid and unconverted lactose and non-lactose di- and oligo-saccharides.

22. A composition as claimed in claim 21, wherein, in an undiluted form, the composition is in the form of a syrup of 40 to 80° Brix.

23. A composition as claimed in claim 22 further comprising a diluent.

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24. A composition as claimed in any one of claims 21 to 23 comprising approximately 10-50% galactose, 0-48% glucose, 1-25% fructose, 1-48% gluconic acid and 0-25% unconverted lactose and non-lactose di- and oligo-saccharides as a % of the total carbohydrate present.

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25. A composition as claimed in claim 24 comprising 30-50% galactose, 10-40% glucose, 5-25% fructose, 1-15% gluconic acid and 1-10% unconverted lactose and non-lactose di- and oligo-saccharides.

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26. A composition as claimed in claim 25, comprising 45-50% galactose, 23-33% glucose, 15-23% fructose, 1-5% gluconic acid and less than 7% unconverted lactose and non-lactose di- and oligo-saccharides.

27. A food comprising a composition as claimed in any one of claims 21 to 26.

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28. A food as claimed in claim 27, comprising a sports energy bar.

29. A drink comprising a composition as claimed in any one of claims 21 to 26.

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30. A drink as claimed in claim 29, comprising a sports drink, wherein said sports drink contains less than 25 mmol/litre of sodium.

31. A process for the production of galactose comprising the steps:

- (i) hydrolysis of lactose to produce glucose and galactose;
- (ii) partial isomerisation of the glucose to fructose;
- (iii) partial oxidation of the glucose to gluconic acid;
- (iv) crystallization of galactose to produce a mother liquor; and
- (v) recovery of galactose crystals from the mother liquor.

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32. Galactose produced by the process of claim 31.
33. A composition comprising the mother liquor produced by the process of claim 31.
- 5 34. A use of the composition of claim 33 as a sweetener in the food industry.
35. A use as claimed in claim 34, wherein the food industry is the dairy food industry.